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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
LAO, SUE X	

ART UNIT	PAPER NUMBER
2126	32

DATE MAILED: 01/29/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

PRG

Office Action Summary	Applicati n No.	Applicant(s)	
	08/880,616	COHEN ET AL.	
	Examiner	Art Unit	
	S. Lao	2126	

-- The MAILING DATE of this c mmunication appears n the c ver sheet with th correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 November 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-14 and 16-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-14, 16-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

1. Claims 1-14, 16-20 are pending. This action is in response to the amendment filed 11/17/2003. Applicant has amended claims 2, 4, 6, 8-11 and 13.

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

3. Claims 1-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zolnowsky (U S Pat. 5,826,081).

As to claim 1, Zolnowsky teaches an apparatus in a UNIX-based environment (SunOS Solaris) for providing scheduling at one time of a plurality of tasks (tasks, processes/threads) of more than one application (applications) among processes in more than one computing node (processors 1, 2, ..., N), each node having a plurality of local processes (threads in processors' own dispatch queues 509, 515, ..., 521), comprising:

global scheduler means (global dispatch queue / real time queue 501) for dynamically (real time) creating a global prioritized schedule (higher priority real time threads) of the plurality of tasks of the more than one application to allow execution (execution) of different tasks of more than one application at the same time at the computing nodes (run on multiprocessor system); and

at least one local scheduler (processor's own scheduler 505, 511, ..., 517) associated with each of the more than one computing node comprising means for receiving (processor selects and takes a higher priority thread from real time queue 501) the global prioritized schedule (real time queue 501), means for ascertaining (assignment decision) which of the plurality of tasks are assigned tasks (higher priority thread from real time queue 501), being assigned to each of the plurality of local processes (verification step 604), means for prioritizing the assigned processes [it is noted that each processor's scheduler schedules and dispatches based on a priority algorithm], and means to update a local priority list (threads in processor's dispatch

queues 509, 515, ..., 521) in accordance with the global prioritized schedule (run higher priority real time threads before running lower priority threads in processor's dispatch queue) to allow simultaneous execution of tasks from the more than one application (run application on multiprocessor system). See col. 5, lines 7-58; col. 6, lines 27-52; col. 8, lines 13-54.

Zolnowsky does not explicitly state that the updating process involves a step of including the assigned processes into the local priority list. However, logically, all the runnable candidate threads in Zolnowsky, whether threads taken from the real time dispatch queue or threads already located in the processor's local dispatch queue, are placed in the processor's local dispatch queue and ordered according to their priorities before the higher priority thread is dispatched and run based on priority scheduling. In addition, Zolnowsky teaches that each scheduler places a runnable candidate thread into its local priority list / dispatch queue before servicing the thread (col. 6, lines 43-52; col. 9, lines 45-50). Therefore, it would have been obvious to logically or physically include / place an assigned processes / runnable candidate thread into the local priority list during an updating / scheduling process in each processor.

As to claim 2, Zolnowsky teaches at least one operating system for receiving input from the means for prioritizing and for directing the assigned processes to execute the tasks in accordance with the prioritizing (SunOS Solaris, col. 5, lines 45-58).

As to claim 3, Zolnowsky teaches the operating system is further adapted to interleave the execution of local tasks with the tasks (SunOS Solaris is multiprocessing/multitasking).

As to claim 4, Zolnowsky teaches application coordinator means for communicating information (real time application scheduling requirements) about the plurality of tasks to the global scheduler means for use in dynamically creating the schedule (col. 6, lines 43-52).

As to claim 5, Zolnowsky teaches the local processes are adapted to perform tasks in parallel (Solaris being multiprocessing/multitasking).

4. Claims 6-14, 16-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zolnowsky as applied to claims 1, 2 in view of Cameron et al (U S Pat. 5,3325,526).

As to claim 6, Cameron teaches task scheduling in a multicomputer system, including global scheduling means (allocator and scheduler component 612) for communicating the global prioritized schedule to the at least one local scheduler (operate in conjunction with partition 614 to assign tasks to nodes, col. 7, lines 43-52). Given the teaching of Cameron, it would have been obvious to include a means for communicating into Zolnowsky. One of ordinary skill in the art would have been motivated to combine the teachings of Zolnowsky and Cameron because Cameron recognizes that a current task/process/thread priority may dynamically change as the priorities of associated application programs or a portion thereof change priority (col. 7, lines 56-68), which would have been desirable for Zolnowsky as the threshold value for real time threads was set/re-set (col. 10, lines 1-13).

As to claim 7, Cameron teaches the local scheduler is adapted to communicate information about the plurality of local processes to the global scheduler (col. 14, lines 12-31). Note discussion of claim 6 for a motivation to combine.

As to claim 8, Zolnowsky as modified teaches the global scheduler means further comprises timer means associated with the communication means to periodically effect communication of the dynamically created prioritized schedule to the local schedulers in that dynamic scheduling occurs at the end of each time slice wherein scheduling operations are performed (as taught by Zolnowsky, col. 8, lines 55-64), including communicating schedule information (Cameron, see discussion of claim 6).

As to claim 9, Cameron teaches the global scheduler means includes at least one table comprising the identity and address for each of the at least one local scheduler (hash tables for locating partitions, col. 13, lines 15-33). Note discussion of claim 6 for a motivation to combine.

As to claim 10, note discussion of claim 6.

As to claim 11, it is a method claim of claims 1, 6 and 7. Note discussion of claim 1 for UNIX-based computing environment, tasks, application(s), node, processes / local

processes, global scheduler means, local scheduler and the steps of dynamically creating and dynamically prioritizing. Note discussion If claim 6 for the step of communicating. Note discussion of claim 7 for the step of providing. As to determining correspondence between the plurality of tasks and the plurality of local processes, this is met by Zolnowsky in that a local process/thread in a processor's own dispatch queue corresponds to a lower priority task compared with a process/thread in the global real time queue (col. 5, lines 16-58).

As to claim 12, Zolnowsky teaches invoking operating system priorities to schedule tasks in accordance with the prioritized schedule in that Zolnowsky implements the priority scheduling in the underlying operating system (col. 5, lines 55-57).

As to claim 13, Zolnowsky as modified teaches communicating the global prioritized schedule of tasks to the at least one computing node (Cameron, discussion of claim 6). It is noted that the global scheduler means is remotely located with respect to the at least one computing (multiprocessor system).

As to claim 14, note discussion of claim 5.

As to claim 16, note discussion of claim 11 except for dynamically creating a prioritized schedule of the plurality of tasks; determining correspondence between the plurality of tasks and the plurality of local processes; and dynamically prioritizing the local processes in accordance with the prioritized schedule. Zolnowsky further teaches executing (execution) and communicating information about execution (affinity) until all tasks have been completed (processor which last ran the thread). See col. 6, line 61 - col. 7, line 49. Zolnowsky repeats these scheduling steps when scheduling each thread for execution.

As to claim 17, note discussion of claim 3.

As to claim 18, Zolnowsky as modified teaches the remotely located scheduler dynamically maintaining at least one list of the at least one computing node (Cameron, layer data 738, col. 9, lines 23-37).

As to claim 19, Zolnowsky teaches the scheduler means is adapted to automatically update the local priority list (see discussion of claim 1).

As to claim 20, Zolnowsky teaches receiving task information (thread's scheduling variables such as affinity, priority) from at least one of an application coordinator and the more than one computing node (communicated with other processors, col. 7, lines 24-43); and maintaining an activity scheduler list (scheduler 1, 2, ..., N) relating to available processes at the computing nodes (associated with respective processors) and an activity priority list based on the task information (dispatch queues, fig.s 4A, 4B).

5. Applicant's arguments filed 11/17/2003 have been fully considered but they are not persuasive.

Regarding Zolnowsky reference, applicant argued that Zolnowsky does not teach a global scheduler creating a global prioritized schedule and communicating the schedule to local computing nodes at which a local scheduler updates a local prioritized schedule because (1) that the high priority real time queue is not a global scheduler means which creates a global prioritized schedule that is then used by local schedulers, (2) that the local scheduler do not adhere to a prioritized schedule obtained from a global sheculer but uses a protocol shown in figure 8, (3) that Zolnowsky does not teach both global and local schedulers are available and wherein a global prioritized schedule is created, updated and communicated to the local schedulers for updating a local prioritized list. (Remarks, page 11, last paragraph – page 13, first paragraph).

The examiner respectfully disagrees. As to (1), the high priority real time queue of Zolnowsky holds the higher priority real time threads at the global level, with the priority order indicating the corresponding dispatching priorities of such threads. In other words, the priority order maintained in the high priority real time queue is a global prioritized schedule for directing dispatching operations. One of ordinary skill in the art would recognize that any queue arrangement includes queue management functionalities such as create, destroy, enqueue and dequeue. The global prioritized schedule is then used by local schedulers in making scheduling decisions because a local scheduler first checks the global prioritized schedule maintained in the high priority

real time queue before checking its own dispatch queue to obtain and dispatch a thread/process for execution. Col. 8, lines 19-54.

As to (2), the claim language does not require that the local scheduler do not adhere to a prioritized schedule obtained from a global scheduler or use the prioritized schedule obtained from a global scheduler *alone* to make dispatching decisions. Instead, the claim language only requires the local schedulers to take into account the global schedule. See for example claim 1, receiving, ascertaining, prioritizing and updating a local priority list. Taking into account the global schedule by a local scheduler in its dispatching process is met by Zolnowsky in that a local scheduler first checks the high priority real time queue and then checks its own dispatch queue to obtain and dispatch a thread/process with highest priority therein, thus meeting updating a local priority list "in accordance with said global prioritized schedule" as recited in claim 1. It is noted the argued figure 8 of Zolnowsky does not show local dispatching protocol as characterized by applicant. Rather, figure 8 illustrates global priority mapping.

As to (3), Zolnowsky teaches both global scheduler means (high priority real time queue 501) and local schedulers (processor's own scheduler 505, 511, ..., 517) are available, wherein a global prioritized schedule is created (priority order of real time threads maintained in the high priority real time queue). The argued updating the global prioritized schedule is not claimed. See claims 1 and 11 for example. Regarding the argued communicating the global prioritized schedule to the local schedulers, which is recited in independent claim 11, but not in independent claim 1, is met by Cameron. Refer to rejection of claim 11 for detail. Updating a local prioritized list in accordance with the global prioritized schedule is met by Zolnowsky in that the updated global priority information maintained in the high priority real time queue is considered/checked together with the local priority information maintained in the processor's own dispatch queue during the dispatching process of a local scheduler.

Regarding Cameron reference, applicant argued that Cameron has no capability to prioritize tasks, nor means for deciding what process or task should execute when a

single process is suspended or waiting. (Remarks, page 13, 2nd paragraph – page 14, last paragraph).

The examiner's position is that Cameron is not relied on to teach prioritizing tasks which is met by Zolnowsky. It is not clear how the argued deciding what process or task should execute when a single process is suspended or waiting is related to the claim language. Cameron is relied on to teach communicating a global/higher_level prioritized schedule to a local/lower_level scheduler (operate in conjunction with partition 614 to assign tasks to nodes). Refer to rejection of claim 6 for detailed discussion.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sue Lao whose telephone number is (703) 305-9657. A voice mail service is also available at this number. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 746-7238 for After Final communications, (703) 746-7239 for Official communications and (703) 746-7240 for Non-Official/Draft communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 305-9600.

Sue Lao
January 23, 2004